MAPPING OF SEA ICE EDGE USING NSCAT DUAL-POLARIZED RADAR MEASUREMENTS

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The trends of polar sea ice extents have been suggested as useful indicators of climate changes. Operationally, the location and change of ice edge in the Arctic are useful for the ship navigation and other applications in coastal waters. Large-scale investigations of the ice cover have been based on the data collected by the Scanning Multichannel Microwave Radiometer (SMMR) instrument and Special Sensor Microwave Image (SSM/I). The SMMR and SSM/I data have been used to produce routine maps of sea ice cone.cntratiol]. However, the most widely used algorithm developed by Nimbus-7 SMMR team for SMMR and SSM/I radiometers remains affected by the spatial and temporal variations in the microwave signature of sea ice and local meteorological conditions.

We have shown that dual-polarized Ku-band scatterometer data could be used to discriminate sea ice from open water. This algorithm, utilizing a combination of backscatter intensity and polarization behavior to separate the open water pixels from the sea ice pixels, was demonstrated with the Ku-band backscatter data acquired by the SeaSat scatterometer in July 1978 and now with NSCAT data. Analysis of NSCAT data shows that the polarized scattering signatures of first year (FY) and multi-year (MY) sea ice in fall and winter are distinct from that of open water. The evolution of sea ice edge derived from NSCAT data appears to be consistent with that indicated in the SSM/I sea ice concentration product. In particular, the Odden ice tongue in the Greenland Sea, which failed to develop during both 1994 and 1995 and was believed to be associated with midgyre convection, was detected in early November 1996 by NSCAT radar measurements. Since the Odden ice tongue consists largely of frazil and pancake ice, this suggests that NSCAT data are applicable not only to MY and FY ice, but also to other ice types. The location of the sea ice edge derived from NSCAT data was also found to be in good agreement with that from RADARSAT Synthetic, Aperture Radar images. Our preliminary results suggest promising applications of NSCAT data for monitoring and change detection of sea ice edge for all seasonal and weather conditions.